DOCUMENT RESUME

ED 179 228 IR 007 898

AUTHOR Ragan, Tillman J.
TITLE Insights on Visual Capacities from Perceptual and Cognitive Styles.
PUB DATE 18 Apr 78
NOTE 22p.; Paper presented at the National Convention of the Association for Educational Communications and Technology (Kansas City, MO, April 17-21, 1978)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Cognitive Development; *Cognitive Style; *Cognitive Tests; Educational Research; *Preschool Children; Testing; *Visual Learning; *Visual Literacy

ABSTRACT

This paper presents the thesis that a perceptual rationale for visual literacy may be found in operational form within what is measured by established tests of cognitive style. Ten primary dimensions of cognitive style are briefly reviewed, including field independence-field dependence, impulsivity-reflectivity, visual-haptic, leveling-sharpening, constricted-flexible control, breadth of categorization, scanning, tolerance for unrealistic experiences, cognitive complexity-simplicity, and conceptualizing styles. Results of these tests are compared with tests for reading readiness and perceptual development designed for use with preschool age children. A conclusion is drawn as to the feasibility of visual literacy programs contributing to perceptual development. References include a bibliography, test instrument sources, and figures which depict sample items from selected test instruments. (Author/RAO)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED179228

U.S. DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

INSIGHTS ON VISUAL CAPACITIES FROM PERCEPTUAL AND COGNITIVE STYLES

Tillman J. Ragan

Associate Professor
University of Oklahoma

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
Tillman J. Ragan

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

April 18, 1978

Presented at the 1978 National Convention of the Association for Educational Communications and Technology, Kansas City, Missouri, April 17-21, 1978.

Educational Technology
College of Education
The University of Oklahoma
Norman, Oklahoma

IR007198

This paper will address itself to relationships between certain cognitive style characteristics and the visual perceptual abilities--or "literacies"--of learners. Cognitive styles appear to have a significant influence on perception, thinking, and behavior. These cognitive styles may provide insights into learners' visual capacities which may provide a new direction for visual literacy programs.

The paper will briefly describe the relevant attributes of ten major style dimensions. Certain test instruments used to measure some of those characteristics will be described and illustrated with an eye to this question: what are the visual task demand characteristics of the instrument? Following a review of selected instruments, relationships will be explored which might exist between cognitive styles and intended outcomes of efforts to develop "visual literacy" among learners. My thesis is that there may be a strong and productive relationship between what cognitive styles are, at least operationally, and at least some of what visual literacy programs might seek to achieve with learners.

Before proceeding further, I want to make reference to an effort that provided background for this paper, "Relationships between Visual Literacy and Visual Memory, Development and Aptitude" (Ragan, 1977a). That presentation included a review of a sample of test instruments which either measure an important visual capacity or which employ a difficult or

critical visual task to measure something else (such as general ability, reading readiness, and so forth). A set was compiled of commonly employed and referenced taxonomies of visual literacy outcomes, such as that by Debes (1969) and Moore (1970), as well as one by Ragan (1977b). My position, both in the paper on visual literacy, memory, etc. and in this paper, is that there is a real need in the visual literacy area for a better grasp of intended outcomes and on the ways in which their achievement might be assessed and described in psychologically definable, generalizable, meaningful ways. Visual literacy teachers/directors can enhance their programs and add to the body of knowledge in visual literacy by employing evaluation and learning activities which are based on perceptual and cognitive factors; factors about which something is already known and for which validated tests are currently available. In the following pages, I want to explore this point by focusing specifically on the relationship between cognitive styles and visual literacy.

COGNITIVE STYLES

Cognitive styles generally reflect differences in the manner in which individuals receive, process and use information. Collectively, cognitive styles are psychological dimensions which are said to represent consistencies in an individual's manner of acquiring and processing information. Following are brief descriptions of ten of the most prominent cognitive style dimensions, from Ragan, et. al. (to be published in 1978).

1. Field independence-field dependence: an analytic as opposed to global manner of perceiving. Field independence reflects the ability to perceive the visual stimuli as separate from an embedded context.
2. Impulsivity-reflectivity: individual differences in speed and errors when faced with response uncertainty. Reflective subjects consider the hypotheses longer and are usually correct upon choosing a response; impulsive individuals tend to select the first response that occurs to them and are usually incorrect.
3. Visual-haptic: the visual perceptual type is said to use his or her eyes as the primary sensory intermediaries while the haptic is said to use his or her eyes only when necessary and relies mainly upon kinesthetic and body orientation.
4. Leveling-sharpening: individual differences in assimilation in memory. Levelers tend to incorporate new ideas with old memories and blur the original image; sharpeners can add new ideas as well as holding on to the new image.
5. Constricted-flexible control: individual differences in reference to susceptibility to distraction.

6. Breadth of categorization: an individual's perference for broad versus narrow categorization.
7. Scanning: an individual difference reflected in extensiveness and intensity of attention deployment.
8. Tolerance for unrealistic experiences: individual differences in willingness to accept perceptions which are at variance with normal experiences.
9. Cognitive complexity-simplicity: differences in individuals' tendency to construe the world in a multi-dimensional and discriminating manner.
10. Conceptualizing styles: individual differences in categorization of stimuli with perceived similarities or differences; utilization of consistent conceptualization; approached in concept formation.

A rather large number of individual researchers and teams of researchers, employing a variety of theoretic approaches have worked on these various dimensions. A summary of approaches to measurement and the major proponents of these ten cognitive style dimensions is presented in table 1.

Insert Table 1 about here

At this point, I want to present some example items from a sample of cognitive style test instruments. The reader is encouraged to take particular note, in the examples to follow, of what visual-perceptual tasks the test requires the subject to perform. To put the first cognitive style example into some perspective, it might be well to study a frame from the Santa Clara Inventory of Developmental Tasks, developed by Richard Zweig and his associates (Gainer, 1974).

Insert Figure 1 about here

In this pre-school instrument for reading readiness instruction and testing, the child is given a drawing in which five animal outlines are superimposed and asked to trace the outline of one particular animal. The task appears to be a special case of discrimination, that of disembedding a figure from an embedded context.

Note now a figure from the Group Embedded Figures Test, or GEFT (Witkin, 1971). The task here also is to find a simple form embedded within a more complex figure. In this case, the figures are nonmeaningful geometric shapes; and the test subject never sees both figures at once, being required to flip the test booklet to the back page to find what the simple form looks like, then return to the complex figure to outline the simple form.

Insert Figure 2 about here

To put it very simply, the GEFT cognitive style measure seems to provide an advanced version of much the same task as the embedded animals item from the Santa Clara Inventory reading readiness material. One should note that there are highly developed systems of instructional materials and teaching methodologies for reading readiness and related areas in widespread use. These systems, developed by Frostig, Montessori, Zweig, and others, seem to share a perceptual development emphasis. But there are no equivalent efforts being directed at development of the "advanced" skills demanded by the GEFT. For older children and adults, very little visual-spatial perceptual development work is done in schools. Perhaps what has been accomplished in this area may be in comcomitant outcomes from elective classes in art, mechanical drawing and industrial arts, and in a few schools, something they call "visual literacy," but there has been little beyond this.

In another sample item from Zweig's Santa Clara Inventory, a figure is shown for five seconds. When the figure is removed, the student is asked to draw the figure. A total of three figures are presented to be drawn from memory.

Insert Figure 3 about here

Similar to the figure memory item is the Successive Perception Test - 1, or SPT-1, an instrument developed in the 1940's to measure visual-haptic perceptual style (Lowenfeld, 1945).

The SPT-1 presents abstract figures on motion picture film; the figures are viewed through a mask which allows only a small section of the figure to be seen at any one time. To select from the alternative figures presented, the test subject must visualize one whole figure and remember it long enough to mentally compare it with the alternative.

Insert Figure 4 about here

Just as the embedded animals frame from the Zweig materials can be compared with the GEFT, the item which demands memory of abstract figures from the Zweig materials seems a related task to the integration and memory task demanded by the SPT-1.

Other tests of cognitive style can be briefly described here to further illustrate the variety of visual task demand characteristics employed. In Kagan's Matching Familiar Figures test, or MFF (Kagan, 1969), the individual is shown a line drawing of a familiar figure, such as a person, ship, and so forth on one page, and on a simultaneously displayed second page, six drawings which appear at first glance to be identical to the model drawing. The subject's task is to find and select which one of the six drawings is an exact match to the model. The other five drawings vary from the model in small details missing, added, or distorted. Those individuals who are both slow and accurate with this task are considered "reflective," and those who are fast and inaccurate are considered "impulsive".

The Color-Word, or Stroop Test, a measure of distractibility, (Gardner, et. al., 1959), requires the subject to read names of colors rapidly, to name blocks of colors rapidly, then quickly read names of colors which are printed in contradictory combinations. The test is a sort of visual tongue-twister, with more distractible individuals making more errors in reading the miscolored words than do less distractible individuals.

The Leveling Sharpening House Test, or LSHT, is an adult measure of leveling-sharpening, and the Leveling Sharpening Wagon Test (LSWT) is a measure of the same cognitive control designed for children (Santostephano, 1964). A large number of line drawing pictures are sequentially displayed to the viewer. Parts of the drawing are gradually omitted in otherwise identical drawings of a house, to use the adult version as an example. The first few omissions are extremely subtle. The individual who detects the changes in the drawing relatively early is considered a "sharpener," and those who fail to detect the differences until they become relatively obvious are considered "levelers."

VISUAL LITERACY AND COGNITIVE STYLES

The constructs behind the cognitive and perceptual style instruments discussed, as well as the ten style dimensions overviewed, are very much at odds with the basic educational optimism behind much of the visual literacy movement. Researchers in cognitive styles are coming from an individual difference frame of reference; and in most cases they are concerned with individual differences which have been

demonstrated, in studies conducted on this question, to be highly resistant to change through instructional or educational intervention. The present concern, however, is not the question of changing cognitive styles but to point out some areas of visual "skill," if you will, which are illustrated by tasks in cognitive style test instruments. I am hypothesizing that these areas of visual skill are human capabilities which appropriate work in visual literacy can help foster.

The differences seen between people, as currently attributed to cognitive style, may be seen as merely aptitude differences, not ceilings on capability. (Such an opinion can not, to my knowledge, be presently supported from an empirical standpoint.) As previously noted, there does not seem to be work in schools directed at the development of advanced visual perceptual skills. Having achieved "reading readiness," it would appear that schools move on to development of cognitive skills in, for example, reading and mathematics. The visual perceptual area may be as open to learning as is reading or intellectual development. Some efforts at visual perceptual development appear to be successful at the pre-school level(Spache, 1976, p. 380-432). It may, however, be that after pre-school and first grade, schools stop doing a good thing.

Whether the justification exists for a parity of effort between the more or less traditional and established outcomes of language, mathematics, and science and the outcomes of increased visual-spatial skills remains a question. In the section to follow, I would like to address that question.

A PERCEPTUAL RATIONALE FOR VISUAL LITERACY

Although the term "cognitive style" seems to be the one that is most commonplace in the literature, a number of these style dimensions were originally conceived of as "perceptual styles," or were from investigations in the area of perception, not cognition. Lowenfeld called his work a "perceptual type;" and Witkin's field independence-dependence, which is perhaps the most widely researched and is responsible for the term "cognitive style," had its beginnings in questions from the study of perception--specifically, questions of perception of the upright. The development of questions in perception having led to something called "cognitive styles," along with the visual-perceptual nature of the instruments used to measure them, brings Arnheim's Visual Thinking to mind (Arnheim, 1969). A fundamental point of Arnheim's is that visual perception, far from being "mere perception" as it has long been considered, includes the same behaviors that we commonly consider only as matters of cognition or "thinking."

A year after Arnheim asked for "the systematic training of visual sensistivity" (1969, p. 315), Moore's taxonomy of perception was published (1970). Employing this taxonomy, one may place the variety of visual tasks employed in cognitive style tests into a meaningful context of educational development goals. Such goals would be, on the one hand, fundamentally

related to the development of visual perceptual skills, and on the other, highly related to cognitive or intellectual skills, strategies and development.

To make the leap from perceptual abilities to cognitive skills and strategies, one may refer to Arnheim, or, as I will do here, employ the literature in cognitive styles. There appears to be a clear relationship across a number of cognitive style dimensions between the style characteristic which is associated with high performance on an essentially visual-perceptual task and high academic performance. In other words, people who are field independent tend to do better in school than people who are field dependent (Arbuthnot and Gruenfeld, 1969; Witkin, et. al., 1977); people who are reflective tend to do better in school work than those who are impulsive (Ausburn, Back, and Hoover, 1976; Kagan, 1965; Kagan, 1966); and people who are visual tend to do better in school work than those who are haptic (Bruning, 1974; Erikson, 1969; Templeman, 1962), to cite only a sample of what appears to be a consistent trend of findings. These style dimensions are theoretically diverse, but they do have one thing in common: they all use visual perceptual tasks of one sort or another in testing instrumentation.

Just as there are analogic language forms--behavioral and semantic parallels between visual and verbal forms of expression--there also seem to be analogic thinking forms, between percepts and concepts, with an attendant complimentary relationship

between perceptual and intellectual development. Such then is the insight on visual literacy which I draw from perceptual and cognitive styles: the importance and feasibility of contributing to advanced perceptual development among learners. A goal of advanced perceptual development seems closely related to educational goals held by whole-brain education advocates who have drawn implications from hemispheric lateralization studies. In may be the case that work in brain physiology has provided inspiration on what might be achieved and that work in perception may lead to better insight into how.

REFERENCES

Arbuthnot, J.B., & Gruenfeld, L. Field independence and educational-vocational interest. Journal of Consulting and Clinical Psychology, 1969, 33, 631.

Arnheim, R. Visual thinking. Los Angeles: Univeristy of California Press, 1969.

Ausburn, L. J., & Ausburn, F. B. Impact of learning styles on air force technical training: Preliminary investigations. AFHRL-TR- - . Lowry AFB, CO: Technical Training Division, Air Force Human Resources Laboratory, to be published in 1978.

Ausburn, L. J., Back, K. T., & Hoover, B. A comparison of remedial and non-remedial readers on selected perceptual style variables. Paper presented at AECT, Anaheim, California, 1976.

Back, K. T., Stansell, V., Ragan, T. J., Ausburn L. J., Ausburn, F. B., and Huckabay, K. Cognitive styles: A bibliography and selected annotations. AFHRL-TR- - . Lowry AFB, CO: Technical Training Division, Air Force Human Resources Laboratory, to be published in 1978.

Bruning, W. A. Visual aptitude as it relates to student achievement in reading and mathmatics. Unpublished doctoral dissertation, University of Oklahoma, 1974.

Debes, J. L. The loom of visual literacy. Audiovisual Instruction, 1969, 14, 25ff.

Erickson, R. C. Visual-haptic aptitude: Effect on student achievement in reading. Journal of Learning Disabilities 1969, 21-25.

Gainer, W. L. (Ed.) Santa clara inventory of developmental tasks. Santa Clara, CA: Santa Clara Unified School District and Richard L. Zweig Associates.

Gardner, R., Holzman, P. S., Klein, G. S., Linton, H., & Spence, D. P. Cognitive control: A study of individual consistencies in cognitive behavior. Psychological Issues, 1959, 1, Whole No. 4.

Kagan, J. Matching Familiar Figures Test, 1969. (This instrument is available only from Mr. Kagan, Havard University, Cambridge, Mass.)

Kagan, J. Individual differences in the resolution of response uncertainty. Journal of Personality and Social Psychology, 1965, 2, 154-160. (a)

Kagan, J., Pearson, L., & Welch, L. Conceptual impulsivity and inductive reasoning. Child Development, 1966, 37, 583-594. (a)

Lowenfeld, V. Tests for visual and haptical aptitudes. American Journal of Psychology, 1945, 58, 100-112.

Moore, M. R. The perceptual motor domain and a proposed taxomony of perception. AV Communication Review, 1970, 18, 379-413.

Ragan, T. J. Relationships between visual literacy and visual memory, development and aptitude. Paper presented at annual meeting of the International Visual Literacy Association, Iowa City, 1977. (a)

Ragan, T. J. Visual literacy and the brain. Paper presented at annual meeting of the Association for Educational Communication and Technology, Miami Beach, 1977. (b)

Ragan, T. J., et. al. Cognitive styles: A review of the literature. AFHRL-TR- - . Lowry AFB, CO: Technical Training Division, Air Force Human Resources Laboratory, to be published in 1978.

Santostefano, S. G. Developmental study of the cognitive control "leveling sharpening". Merrill-Palmer Quarterly, 1964, 10, 343-360.

Spache, G. D. Investigating the issues of reading disabilities. Boston: Allyn and Bacon, 1976.

Templeman, K. D. A study of the relationship between the haptic and visual creative types and reading achievement in first and sixth grade children. Unpublished mather's thesis. Cornell University, 1962.

Witkin, H. A., Moore, C. A., Goodenough, D. R., & Cox, P. W. Field dependent and field independent cognitive styles and their educational implications. Review of Educational Research, 1977, 47, 1-64.

Witkin, H. A., Oltman, P. K., Raskin, E., & Karp, S. A. A manual for the embedded figures test. Palo Alto, California: Consulting Psychologists Press, 1971.

SPT-1 (film no. SFP-112B)
Mr. Ralph Nichols
Headquarters AAVS/LGDR
Norton AFB, CA 92409

Availability may be restricted to organizations which have military or government contracts.

Leveling Sharpening House Test; Stroop Test
Dr. Sebastiano Stantosefano
Director of Child Psychology and Associate Professor
Havard Medical School
McLean Hospital Children's Center
115 Mill Street
Belmont, Massachusetts 02178

Cost of Stroop Test $15 cost of House Test $50.

Matching Familiar Figures Test
Dr. Jerome Kagan
Department of Psychology and Social Relations
Harvard University
William James Hall
33 Kirkland St
Cambridge, Massachusetts 02138

Cost of MFF $7.00

Embedded Figures Test (Group and Adult)
Consulting Psychologist Press
577 College Avenue
Palo Alto, CA 94306

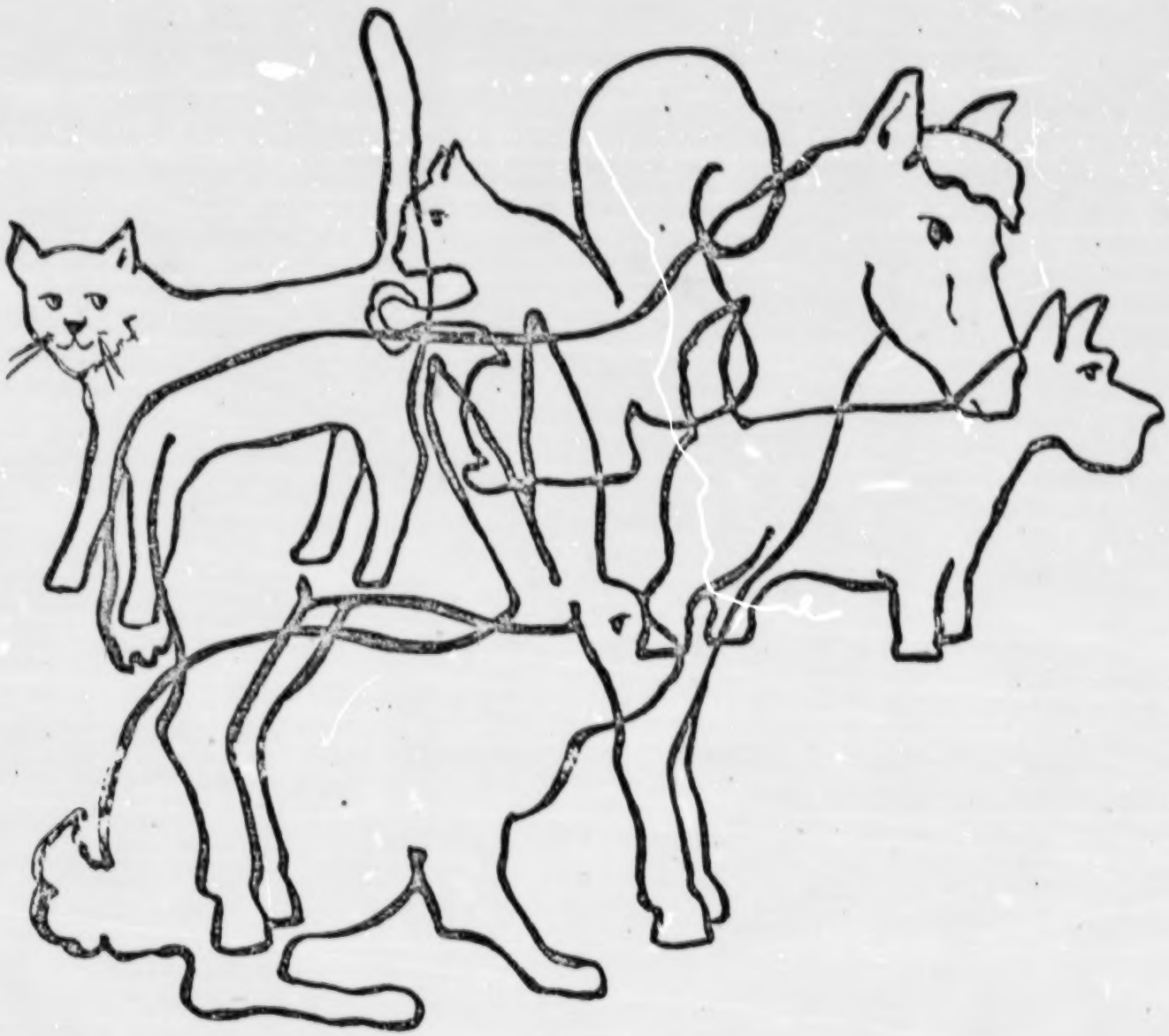
Cost of GEFT $225 for 500 copies

Table 1

Summary of Cognitive Style Dimensions

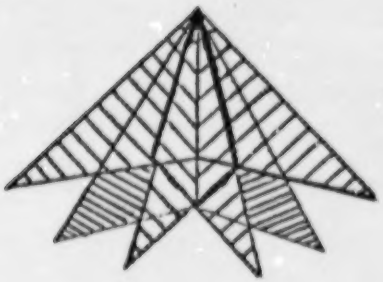
STYLE DIMENSION	MEASURE	PROPONENTS
PSYCHOLOGICAL DIFFERENTIATION Field Dependence-Independence	ROD & FRAME TEST EMBEDDED FIGURES TEST	WITKIN, ET. AL.
COGNITIVE TEMPO Impulsivity-Reflectivity	MATCHING FAMILIAR FIGURES TEST	KAGAN
PERCEPTUAL STYLE Visual-Haptic	SUCCESSIVE PERCEPTION TEST	LOWENFELD
SCHEMATIZING PROCESS Leveling-Sharpening	SCHEMATIZING TEST HOUSE TEST	HOLZMAN, KLEIN SANTOSTEPHANO
DISTRACTIBILITY Constricted-Flexible Control	STROOP TEST FRUIT DISTRACTION TEST	SANTOSTEPHANO GARDNER
BREADTH OF CATEGORIZATION Broad-Narrow	QUESTIONNAIRE (Pettigrew, 1958)	PETTIGREW KOGAN
ATTENTION DEPLOYMENT Scanning-Focusing	SIZE ESTIMATION TASKS	SCHLESINGER, GARDNER
TOLERANCE FOR UNREALISTIC EXPERIENCES Tolerant-Less Tolerant	APPARENT MOVEMENT ILLUSIONS	KLEIN GARDNER
COGNITIVE COMPLEXITY	ROLE CONSTRUCT REPETORY TEST	KELLY (VS. HARVEY, HUNT, SCHRODER)
CONCEPTUALIZING STYLES Analytic-Relational	SORTING/GROUPING TASKS	GARDNER, KAGAN

Figure 1

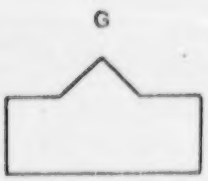


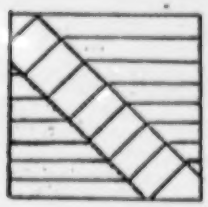
from: Gainer, William L., Ed., Santa Clara Inventory of Developmental Tasks. Santa Clara, Calif.: Santa Clara Unified School District and Richard L. Zweig Associates, 1974, p. 53.

Figure 2

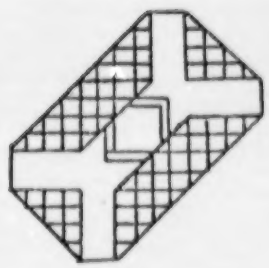


Find Simple Form "F"





Find Simple Form "G"

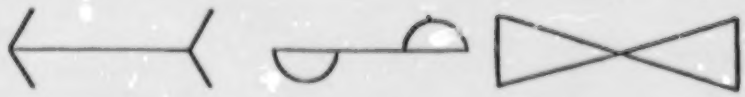


Find Simple Form "H"

Example frames from Group Embedded Figures Test, Consulting Psychologists Press.

Figure 3

Material: Three response cards



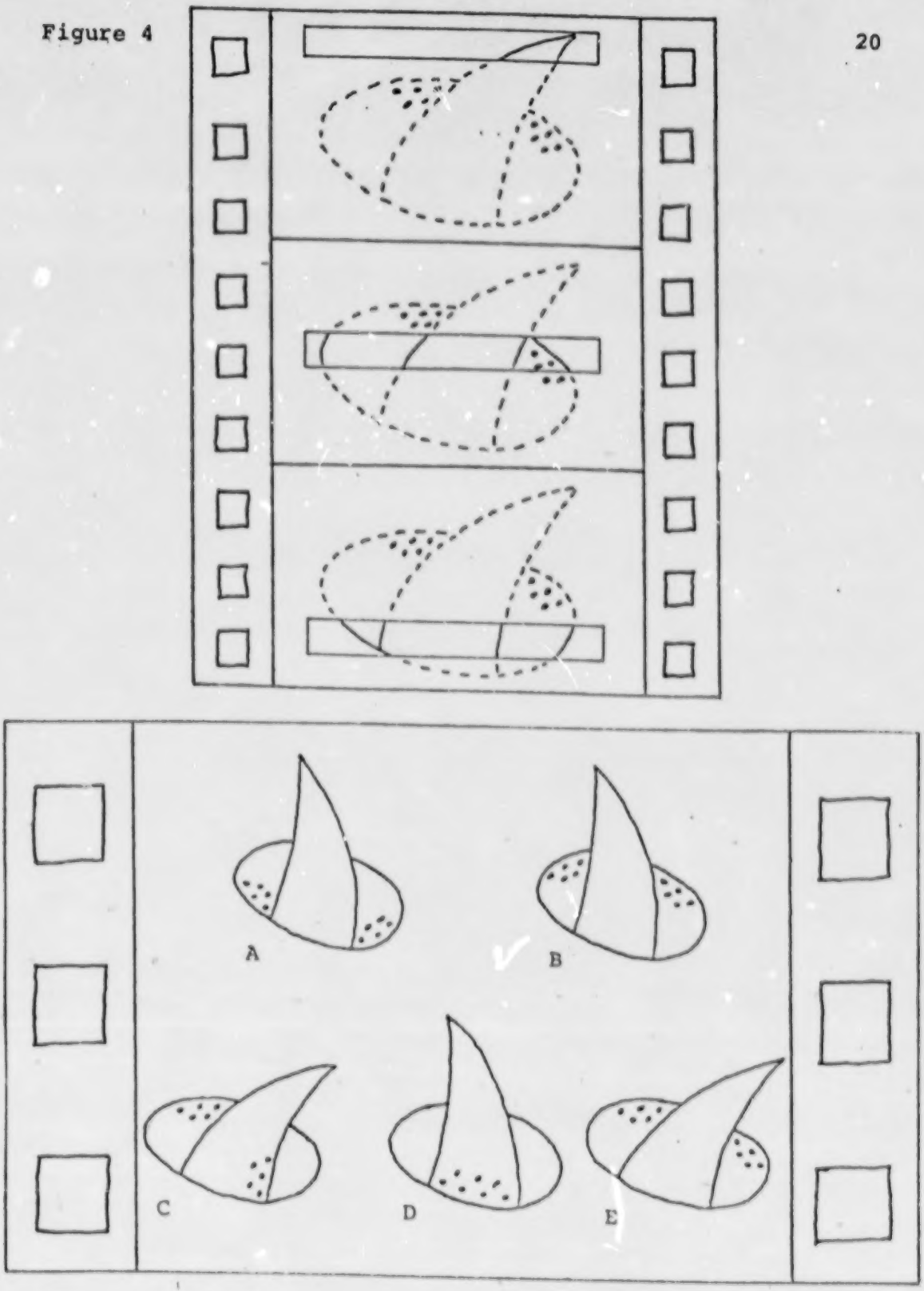
Procedure: Say, "I'm going to show you a card with a design on it. After I turn the card over, you draw one just like the one on the card." Show child the card for five seconds.

Scoring:

0	1	2
Child cannot reproduce two or more designs	Child cannot reproduce one design	Child can reproduce the three forms accurately

from: Gainer, William L., Ed., Santa Clara Inventory of Developmental Tasks. Santa Clara, Calif.: Santa Clara Unified School District and Richard L. Zweig Associates, 1974, p. 63.

Figure 4



Example item (illustration) from Successive Perception Test - 1, U.S. Army Air Corps.